request that this rejection be held in abeyance until one of the applications is ready to issue. At that time, Applicants will file a terminal disclaimer.

**Rejections under 35 USC §103**

Claim 1 is rejected under 35 USC §103(a) as being unpatentable over JP '204 (JP 62-191204) in view of JP '603 (JP 03-258603) and JP '214 (JP 10-129214) and optionally further in view of Lucas '211 (US Patent No. 5,967,211).

This rejection is traversed for the following reasons.

**Present Invention**

The present invention relates to a studless tire, wherein glass fibers or carbon fibers having an average fiber diameter of 1 to 100 μm and an average length of 0.1 to 5 mm are dispersed in a diene rubber in an amount of 3 to 20 parts by weight based on 100 parts by weight of the diene rubber. The fibers are oriented in a thickness direction of a tread in such a way that the glass fibers or carbon fibers so that a complex elastic modulus E1 in the thickness direction of the tread and an elastic module E2 in a circumferential direction of the tire measured at 25°C satisfy the equation $1.1 \leq E1/E2 \leq 4$. The hardness of the tread rubber measured at -10°C is 45 to 75 degrees.

**Disclosure of JP '204**

JP '204 discloses a skid-proof tire that is comprised of 5 to 60 parts by weight of an anti-slip agent such as organic fibers, glass, carbon, ceramics, or metal, which is blended in with 100 parts by weight tread rubber. The anti-slip agent is exposed to the outer surface of the tread rubber. The anti-slip agent is composed of short filament-like fibers arranged orthogonal to the outer surface of the tread. The tire reduces dust generation.

**Disclosure of JP '603**

JP '603 discloses a pneumatic tire for driving on icy roads with fiber bundles buried in the tread rubber. The rubber does not penetrate into the bundle core, and the ends of the fibers are exposed on the tread surface. The hardness of the tread rubber is between JIS 45 and JIS 50.

**Disclosure of JP '214**

JP '214 discloses a tire wherein the strength is said to improve by changing the orientation of the short fiber in a rubber block and a base tread. In particular, JP '214 discloses a tread for an off-road tire that comprises a rubber block and a base tread. The short fiber (in the rubber composition to constitute the tread) is oriented in the radial direction from

the center of a tire in the rubber block, and oriented in the circumferential direction of the tire in the base tread. The strength in the circumferential direction of the tread for the off-road tire to be obtained is increased by arranging the short fiber in the base tread in the circumferential direction of the tire. The chunking resistance and the edge chipping resistance of the rubber block are improved by arranging the short fiber in the rubber block in the radial direction (Z-axis direction) from the center of the tire. The rubber composition used in the tread for any regular tire may be acceptable.

**Disclosure of Lucas '211**

Lucas '211 discloses a tire with a rubber tread reinforced with silica and containing one or more additives designed to aid ice traction for the tread. The additive is selected from at least one of (i) at least one organic fiber having hydroxyl groups on the surface thereof selected from cellulose fibers and wood fibers and (ii) small, hollow, spherical ceramic particles having silanol groups on the surface thereof. The rubber is composed of at least one or more diene-based sulfur vulcanizable elastomers having a Tg of less than -30° C and containing silica as predominant particulate reinforcement and other traditional rubber compound ingredients. In particular, a coupler is used

to couple the silica as well as the said additive(s) to the elastomer(s) in the tire tread composition.

**Removal of the Rejection over JP '204 in view of JP '603 and JP '214 and optionally further in view of Lucas '211**

In the present invention, $1.1 \leq E1/E2 \leq 4$, which is an element of claim 1, is met only when glass fibers or carbon fibers having a specific size are used as short fibers and a small amount of the fibers (to 20 parts by weight based on 100 parts by weight of the diene rubber) is compounded, by which dispersion and orientation of fibers in the rubber composition are easily made. Moreover, by satisfying the elastic modulus ratio as in the above formula, it is possible to obtain a tire having excellent performance on icy and snowy roads, which improves or balances adhesion, adhesion friction, digging-up friction, scratching friction and abrasion resistance (please see page 13, lines 18 to 27 of the present specification). Further, the tire of the present invention has excellent properties on ice and snow by specifying a range of rubber hardness.

In the present invention, glass fibers or carbon fibers are used as short fibers. Glass fibers or carbon fibers are preferable because they are broken into a suitable short length during the process of mixing the rubber. Further, with glass or carbon fibers, it is easy to disperse and orient the fibers, and

to obtain a rubber having a suitable ratio of the complex elastic modulus (please page 6, lines 6 to 9 of the present specification). Compounding glass fibers or carbon fibers in a small amount of 3 to 20 parts by weight improves the problem of tread block rigidity becoming excessively high, and the tread rubber surface not being able to follow the ice and snow road surface, thus lowering adhesion and adhesion friction (see page 6, line 26 to page 7, line 1 of the present specification).

These effects are apparent from the Examples. In Comparative Example 4 of the present specification, 30 parts by weight of glass fibers were compounded based on 100 parts by weight of diene rubber but the elastic modulus ratio E1/E2 was 4.15. Please note this is greater than 4. As a result, the braking performance on ice of the obtained tire declined. In contrast, in Examples 1 and 2 in which 5 parts by weight of glass fibers or carbon fibers were compounded based on 100 parts by weight of diene rubber, the elastic modulus ratio E1/E2 was 1.42 and 1.46 and within the range of the present invention. As a result, compared to Comparative Example 4, the braking performance on ice was improved significantly (see page 13, lines 6 to 17 of the present specification).

Also, the tire of the present invention has excellent performance on ice and snow, by not only orienting a small amount of short fibers in the tread thickness direction but also

preparing the tread rubber hardness at -10°C to 45 to 75 degrees. If the hardness measured at -10°C is smaller than 45 degrees, the rubber is excessively flexible at room temperature and the steering stability on dry road surfaces deteriorates (see page 5, lines 11 to 14 of the present specification). If the hardness is greater than 75 degrees, the rubber itself becomes excessively hard, the contact property between tread rubber surface and ice and snow road becomes inferior, which, in turn, lowers the running performance on icy and snowy roads (see page 6, lines 14 to 18 of the present specification)

All of the above mentioned effects are apparent from the Examples. In Comparative Example 5 of the present specification, even when the compounded amount of glass fibers was small (5 parts by weight), in the case that the hardness at -10°C was greater than 75 degrees, braking performance on ice declined. In contrast, in Examples 1 and 2 in which the hardness at -10°C was 61 and 62 and within the range of the present invention, compared to Comparative Example 5, braking performance on ice improved significantly (see page 13, lines 6 to 17 of the present specification).

In this way, in the present invention, a tire having excellent performance on snow and ice is obtained when a small amount of a specific type of short fibers is compounded to the

tread rubber and the tread has a specific elastic modulus ratio and specific rubber hardness.

However, $1.1 \leq E1/E2 \leq 4$ is not necessarily fulfilled by simply compounding a small amount (3 to 20 parts by weight) of glass fibers or carbon fibers to diene rubber. Whether $1.1 \leq E1/E2 \leq 4$ is satisfied or not depends on the type of short fibers and how those fibers are dispersed.

In Example 1 of the present specification, braking performance on ice was 125 and abrasion resistance was 100. Applicants, herein submit the attached 37 CFR §1.132 declaration executed by Akira Minagoshi. In Experiment 1 of the the attached declaration, glass fibers were used and $1.1 \leq E1/E2 \leq 4$ was satisfied. However, short fibers were compounded in a relatively large amount of 25 parts by weight based on 100 parts by weight of diene rubber. In this experiment, the properties of braking performance on ice, which was 115, and abrasion resistance, which was 93, became inferior. In Experiment 2, when glass fibers were compounded in the relatively small amount of 5 parts by weight based on 100 parts by weight of diene rubber, $1.1 \leq E1/E2 \leq 4$ was not satisfied and the properties of braking performance on ice, which was 92, and abrasion resistance, which was 99, also were inferior. Additionally, in Experiment 3, when short fibers were compounded in the relatively small amount of 5 parts by weight based on 100 parts

by weight of diene rubber, $1.1 \leq E1/E2 \leq 4$ was satisfied. However, vinyl chloride fibers were used in Experiment 3 and both the properties of braking performance on ice, which was 90, and abrasion resistance, which was 96, were inferior.

From this declaration it should be clear to those of ordinary skill in the art that many conditions must be satisfied in order to attain the properties desired in the instant invention. If all of these properties (as claimed in claim 1) are not satisfied, one does not attain the desired performance. In particular, the conditions utilized in dispersing a specific type of short fibers in diene rubber, the compounding of a small amount of short fibers and a specific elastic modulus ratio of the tread should all be satisfied to meet the properties desired in the tire of the present invention.

JP '204 discloses that when using a tire on snowy or icy roads, in order to increase friction and improve braking performance, an anti-skid agent is compounded into the tread rubber and exposed from the tread surface and oriented perpendicular to the tread surface. The anti-skid agent to be filled into the tread is organic fibers, inorganic fibers, such as glass, carbon, ceramic or metal, which are preferably made into short fibers.

However, JP '204 describes neither the complex elastic modulus ratio (E1/E2) nor the rubber hardness of the tread

rubber. Furthermore, there are no specific descriptions such as Examples. Thus, JP '204 fails to disclose many of the features necessary to create the properties desired in the tire of the instant invention.

JP '204 discloses inorganic fibers such as glass fibers and carbon fibers in addition to organic fibers. However, the mechanism of dispersing and orienting by breaking into a suitable short length during the process of mixing rubber and obtaining rubber having a suitable complex elastic modulus ratio (as disclosed in the instant invention) is neither described nor suggested in JP '204.

Moreover, JP '204 discloses that the amount of short fibers to be added is 5 to 60 parts by weight. However, the fact that $1.1 \leq E1/E2 \leq 4$, which is an element of the present invention, is satisfied by adding glass fibers or carbon fibers in a relatively small amount of 3 to 20 parts by weight is neither described nor suggested. Thus, the instant invention describes unexpectedly superior properties, which could never be gleaned from the disclosure of JP '204.

JP '214 discloses nylon, polyester, aramid and rayon as short fibers. Lucas '211 discloses cellulose fibers and wood fibers as short fibers. These short fibers are low in elastic modulus compared to the glass fibers or carbon fibers used in the present invention and are not broken into a suitable short

length during the process of mixing rubber. Accordingly, neither JP '214 nor Lucas '211 is able to make up for the deficiencies present in JP '204.

JP '603 also discloses organic fibers, natural fibers, and inorganic fibers as short fibers but only nylon 6 is used in the Examples. In JP '603, the use of glass fibers or carbon fibers is not utilized and by reading the specification one of ordinary skill in the art would understand that it is not intended. Therefore, substituting organic fibers with glass fibers and carbon fibers would not be made by one of ordinary skill in the art.

Consequently, as can be surmised from the above arguments, even when all of JP '603, JP '214 and Lucas '211 are combined with JP '204, the instant invention would not be attained. In particular, the desired properties of the instant invention are not attained unless one carefully controls the conditions regarding the type of short fibers, the amount of short fibers, the elastic modulus ratio and the rubber hardness. None of JP '603, JP '204, JP '214, and Lucas '211 control these parameters. Accordingly, the rejection is inapposite. Withdrawal of the rejection is warranted and respectfully requested.

With the above remarks, it is believed that the claims, as they now stand, define patentable subject matter such that a

passage of the instant invention to allowance is warranted. A Notice to that effect is earnestly solicited.

Pursuant to 37 C.F.R. §§ 1.17 and 1.136(a), Applicant(s) respectfully petition(s) for a one (1) month extension of time for filing a reply in connection with the present application, and the required fee of $110.00 is attached hereto.

If any questions remain regarding the above matters, please contact Applicant's representative, T. Benjamin Schroeder (Reg. No. 50,990), in the Washington metropolitan area at the phone number listed below.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

BIRCH, STEWART, KOLASCH & BIRCH, LLP

By ___________________________

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65
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Attachment: Declaration 1.132